(12) UK Patent Application (19) GB (11) 2 106 240 A

(21) Application No **8219209**
(22) Date of filing **2 Jul 1982**
(30) Priority data
(31) **8128562**
(32) **22 Sep 1981**
(33) **United Kingdom (GB)**
(43) Application published
7 Apr 1983
(51) **INT CL³**
F24F 7/007
(52) Domestic classification
F4V B3D
U1S 1738 2311 2321 F4V
(56) Documents cited
None
(58) Field of search
F4V
F4X
B4Q
(71) Applicants
Howorth Air Engineering Limited
(Great Britain),
Lorne Street, Farnworth,
Bolton, Lancashire
BL4 7LZ
(72) Inventor
Frederick Hugh Howorth
(74) Agents
Barlow Gillett and Percival,
94 Market Street,
Manchester M1 1PJ

(54) Air-conditioned workstation

(57) To avoid creation of a central dead space (in which contamination is likely to occur) between diverging downward currents of air in a work area, for example chamber 21 of a micro-biological safety cabinet 20, floor 24 is provided with a shallow rim or flange 28, of height not exceeding 2 cm. Down-flowing air approaches floor 24 vertically and only moves outwards, in accordance with the Coanda effect, upon encountering floor 24. Suction is applied to take-off duct 27 to enhance lateral movement of air over the lip or flange 28.

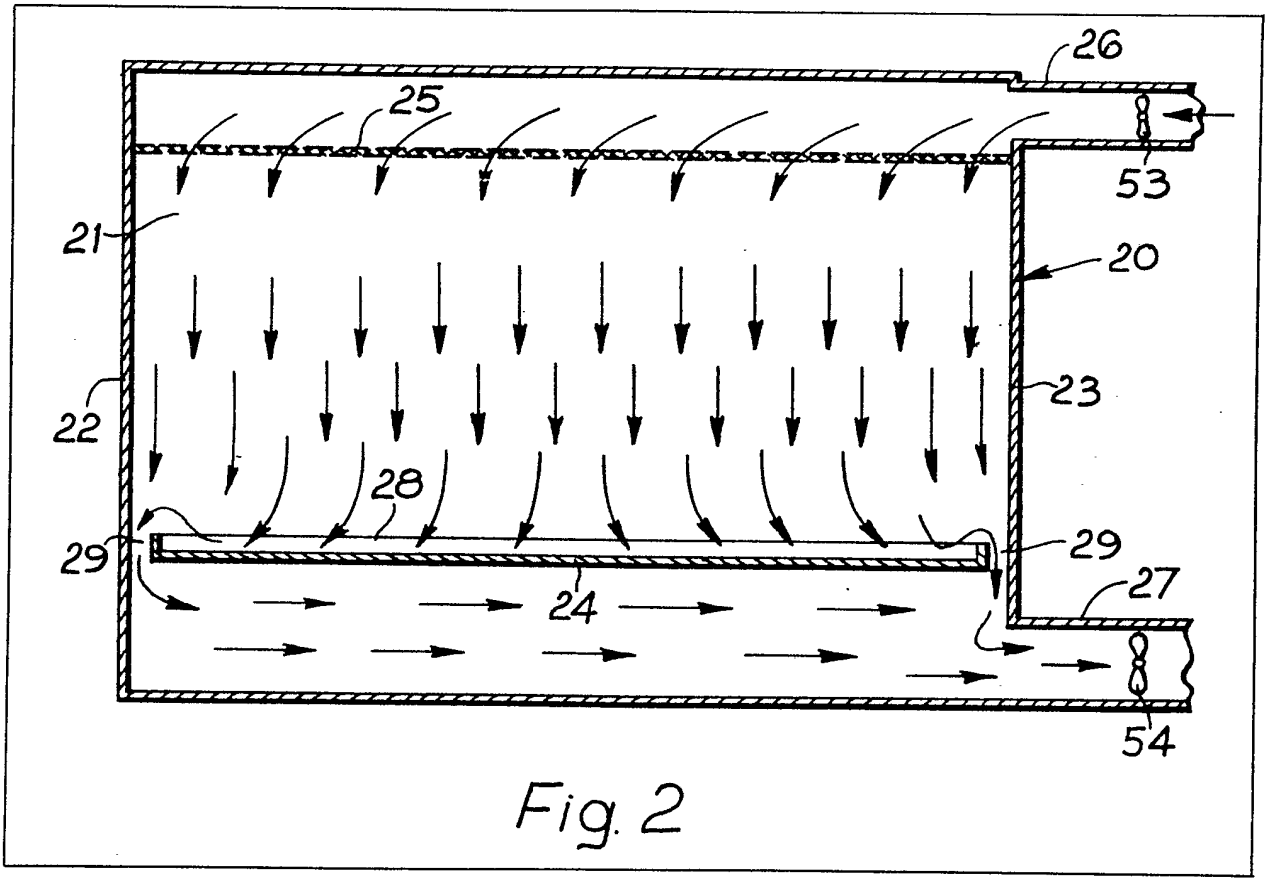

Fig. 2

GB 2 106 240 A

The drawings originally filed were informal and the print here reproduced is taken from a later filed formal copy.

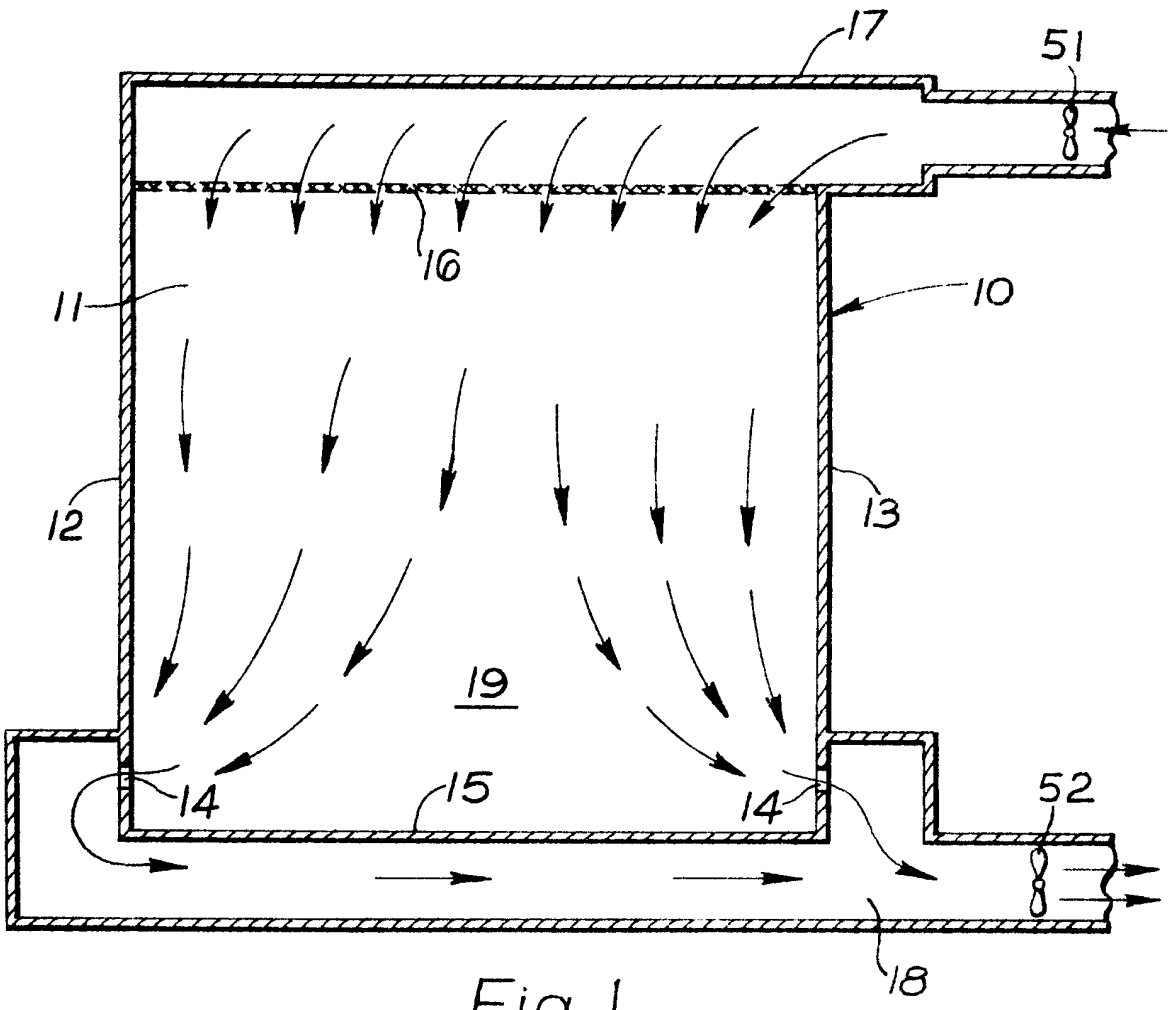

Fig. 1

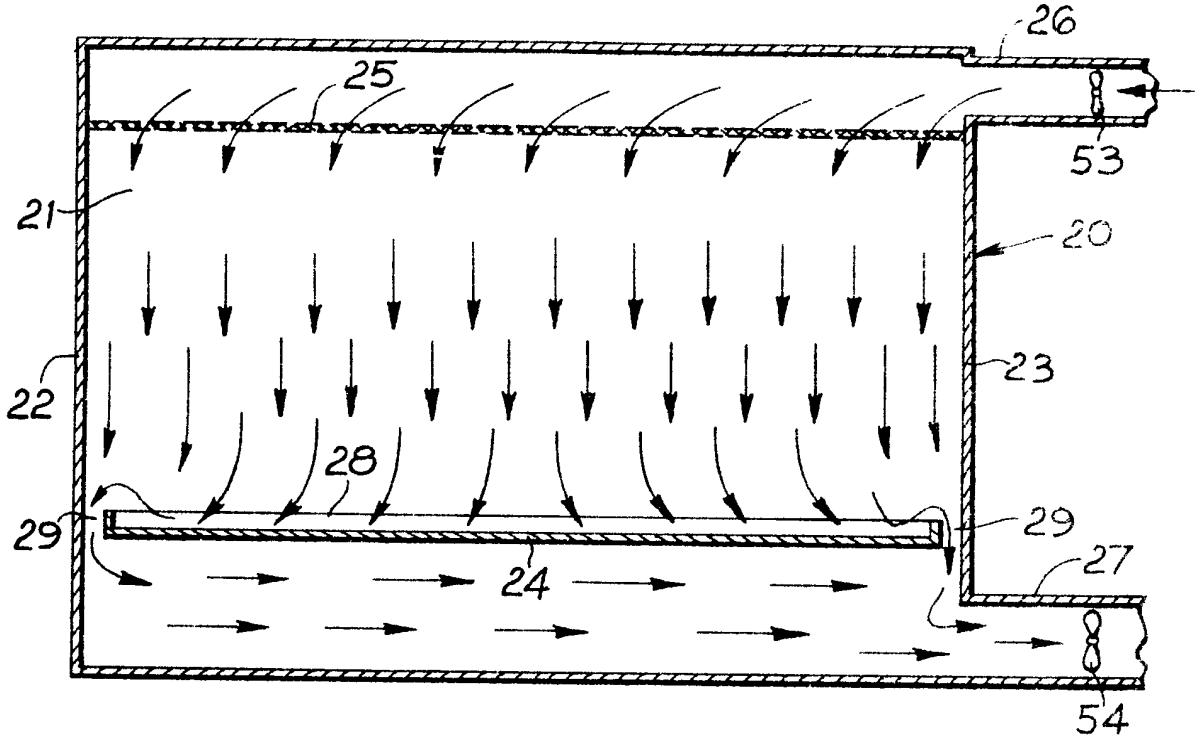
26
25
53
21
20
22
23
28
29
29
24
27
54

Fig. 2

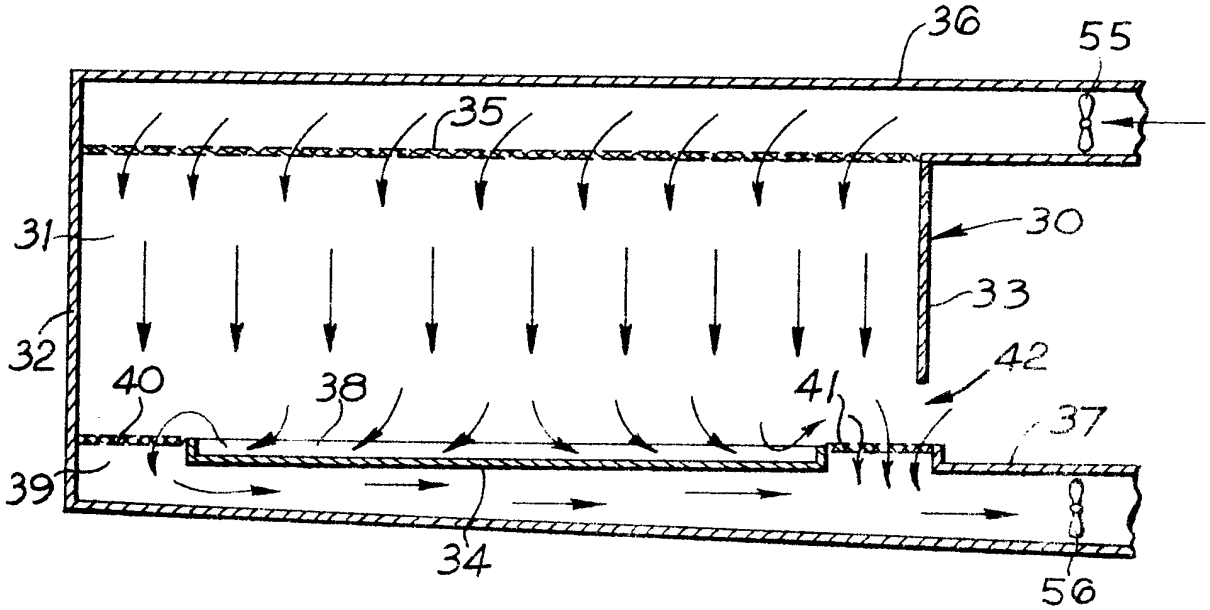
36
55
35
31
30
33
32
42
40
38
41
37
39
34
56

Fig. 3

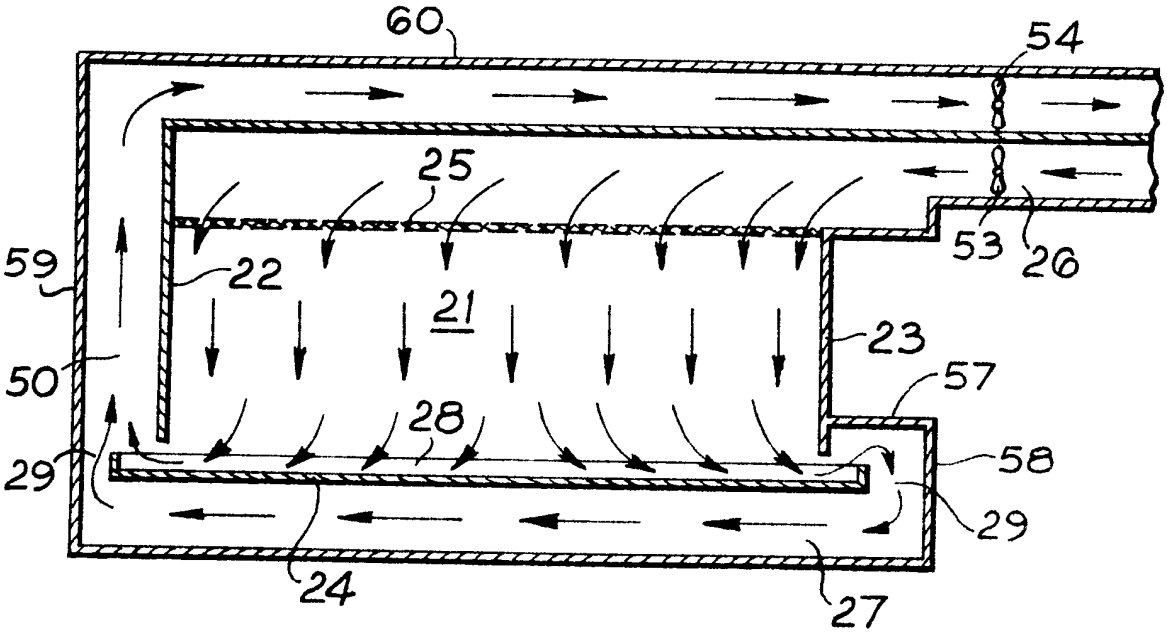
60
54
25
59
22
53
26
21
23
50
57
28
58
29
29
24
27

Fig. 4

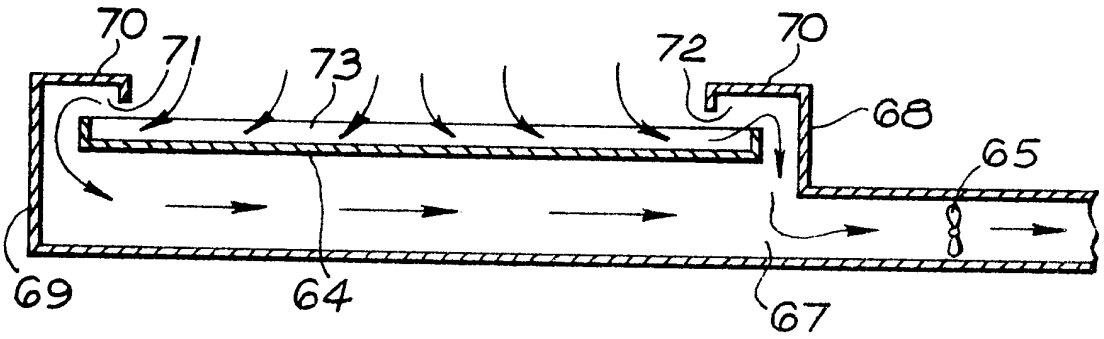
70
71
73
72
70
68
65
69
64
67

Fig. 5

SPECIFICATION

Air-conditioned workstation

This invention concerns air-conditioned workstations of the kind comprising a working area and having air circulation means for supplying filtered air to this working area and for drawing air away from the working area, thereby to lessen the risk of cross-contamination of material being worked upon in the area, or of contamination of or by persons working in the area.

One practical example of such a workstation is a so-called biological safety cabinet which defines a working chamber to which an operative can have access by his arms and through which air is circulated, the arrangement being such that an inflow of air occurs at a front opening of the cabinet, through which the operative inserts his arms, to prevent contamination of the operative.

Such cabinets are used widely for microbiological operations, an operative using the cabinet, sits in front of the cabinet and works on material in the working compartment with his hands and lower arm portions inserted through the opening above which is a window permitting observation of the operations being performed.

Other examples of such workstations are operating tables in hospitals and autopsy tables.

In all of these examples, filtered air descends from above towards a generally planar working surface. It is drawn away at the sides of the working area and is either discharged to atmosphere or is recirculated, after being subjected to suitable decontamination treatment, for instance by passing it through a HEPA (high efficiency particulate air) filter.

All of the known constructions of workstations as above discussed suffer from the disadvantage that the withdrawal of air at a significant level above the sides of the planar working surface has the effect of tending to divide the air stream so that it diverges outwards towards the edges of the working surface and a central dead zone can arise, approximately in the middle of the working surface, where cross contamination can occur.

An object of the present invention is to provide arrangements whereby this parting of the descending air current is substantially eliminated.

With this object in view, the present invention provides an air-conditioned workstation of the kind above referred to in which air is caused to flow downwards towards a generally horizontal planar work surface characterised in that said work surface is provided around its perimeter with a shallow lip of flange of height not exceeding 2 cms, and in that means is provided for enabling suction to be applied so as to draw air, laterally over said lip or flange, from above the work surface.

We have discovered that with such an arrangement separation of the downwardly-flowing air current and creation of a dead space at the middle of the working surface are effectively eliminated. The down flowing air current approaches the work surface substantially vertically, that is to say perpendicularly to the work surface, and only upon encountering the latter does it start to move outwards towards the side edges of the work surface. A general drift of the air, in what might be regarded as coherent layers, over the upper surface of the work surface is achieved as a result of the so-called Coanda effect from which it is known that gases flowing adjacent a surface tend to adhere to that surface.

The invention will be described further, by way of example, with reference to the accompanying drawings in which:

Fig. 1 is a diagrammatic sectional elevation illustrating the basic construction of a conventional air-conditioned workstation;

Fig. 2 is a view comparable with Fig. 1 but illustrating a first practical embodiment of the workstation of the invention;

Fig. 3 is a view similar to Fig. 2 but illustrating a second embodiment;

Fig. 4 is a view similar to Figs. 2 and 3, but illustrating a third embodiment, and

Fig. 5 is a view comparable with Figs. 2, 3 and 4 but illustrating a fourth embodiment.

Referring firstly to Fig. 1, this figure illustrates, diagrammatically, the construction of a known form of air-conditioned workstation, e.g. in the form of a microbiological safety or like cabinet 10. This cabinet 10 defines a working chamber 11 in walls 12 and 13 of which are air outlets 14 which are at a substantial level above floor 15 of the cabinet. The ceiling of the working chamber 11 is provided by a mesh panel 16 through which air is supplied to the chamber 11 from a supply duct 17. Beneath the chamber 11 is an air take-off duct 18 to which the air outlets 14 open, and the arrangement includes one or more filters (not shown) and centrifugal impellers or fans 51, 52 for ensuring that the air drawn from the chamber 11 through the outlets 14 is recirculated into the chamber 11 by way of the supply duct 17 and the mesh panel 16 after being filtered.

The various arrows shows within the cabinet 10 in the figure illustrate generally the flow of air through the chamber 11. Practical experiments show that it is virtually impossible, with the known construction of workstation where the conditioning air is descending towards a generally planar work-supporting surface such as the floor 15, to avoid separation of the air flow, with the result that there is a dead space, indicated generally by the numeral 19, of diverging or trumpet-like configuration, above the middle region of the floor 15. Because of this dead space, there is a risk of cross-contamination occurring in relation to materials being worked on in the chamber 11.

The same considerations would apply in the case where the workstation is a workroom or operating theatre, in that there is a risk of contamination of or by operatives within the room or theatre.

Figs. 2 to 5 illustrate four different embodiments of workstation constructed in

accordance with the invention and wherein the above-discussed air-stream separation is avoided.

Fig. 2 illustrates, diagrammatically, a workstation comparable with Fig. 1 and comprising a cabinet 20 enclosing a working chamber 21 defined between upright sidewalls 22, 23, floor 24 and mesh panel ceiling 25, with air supply duct 26 disposed to supply air through the ceiling 25 and a take-off duct 27. Accordingly, the duct 26 serves to supply filtered air to the chamber 21 and after passing down through the chamber 21 such air is conducted away by way of the take-off duct 27. Impellers 53, 54 cause recirculation of the air by way of filter (not shown), from the take-off duct 27 to the supply duct 26.

In this workstation, the creation of a dead space in the air stream passing down within the chamber 21 is avoided by providing for the floor 24 to have a shallow rim or flange 28 of height not exceeding three-quarters of an inch (2cm) and for the floor 24 to be surrounded by a gap 29, defined between the rim or flange 28 and the side walls 22, 23, whereby the air current passing down the side walls 22, 23 is able to pass directly into the gap 29. Practical tests show that, with such an arrangement, the air passing down the sidewalls 22, 23 and through the gap 29 tends to entrain with it air from above the floor 24, this being drawn over the shallow rim or flange 28 which is, for instance, of the order of 1cm to 1.5cms in height.

Now, it is already well known that a gas stream flowing adjacent a continuous surface tends to adhere to such surface. This is known as the Coanda effect. In the arrangement of the invention the air current passing over the floor's rim or flange 28 creates a generally outwardly-progressing movement of the air adhering to the upper surface of the floor 24 and has the effect of eliminating the dead space which arises in the above-discussed embodiment. The air stream descending within the chamber 11 does not part or diverge, but follows a downward path substantially perpendicular to the floor 24 until it encounters the latter or any material supported on the floor. As a result, the possibility of cross-contamination of materials and/or persons using or occupying the workstation is eliminated.

Turning now to Fig. 3, this figure illustrates diagrammatically a workstation in the form of a microbiological safety cabinet 30 in which a working chamber 31 is defined between rear wall 32, front wall 33, floor 34 and mesh ceiling 35, with air supply duct 36 serving to supply filtered air into the chamber 31 from above through the ceiling 35 so that it descends to the floor 34 and is drawn away, over rim or flange 38 of the floor 34, by way of gap 39 into take-off duct 37. In this instance, the gap 39 is relatively wider than the gap 29 in the Fig. 2 embodiment, and is masked by mesh panels 40, 41.

The front wall 33 of the cabinet 30 is formed with an opening 42 whereby an operative may insert his hands and lower arms to work on materials (not shown) supported on the floor 34, and that part of the front wall 33 which is immediately above the opening 42 is formed with a window or is transparent, to permit the operative to observe the material he is working on.

As with the preceding embodiment, the apparatus includes fans 55, 56 and filters (not shown) for circulating the air as has already been mentioned. The arrangement is such that a small proportion of the air delivered by the fan 56 after filtration, is passed to atmosphere, and a corresponding volume of air is drawn into the cabinet 30 by way of the opening 42. This, of course, ensures that contaminated air from the working chamber 31 does not migrate outwards through the opening 42, and accordingly provides a safeguard against contamination for the operative. The indrawn air flows through the mesh panel 41 covering the gap 39 between the floor 34 and the front wall 33 and directly into the take-off duct 37. The mesh panels 40, 41 obviously prevent large objects from falling through the gap 39 and from blocking the take-off duct 37.

In this embodiment, the filtered air discending within the working chamber 31 descends as a vertical current until it encounters the floor 34, without separating or creating any dead space, and thereafter flows across the upper surface of the floor 34 to which it adheres as previously described.

Precisely the same effect, as in the embodiment of the Figs. 2 and 3, is achieved in the embodiment of Fig. 4 of the drawings, in which the same reference numerals have been used as those of Fig. 2 for those parts which correspond to what has already been described with reference to Fig. 2.

In this embodiment, however, the upright sidewalls 22 and 23 terminate, at their lower edges, at a short spacing above the upper surface of the floor 24 and the dimensions of the floor 24 are such that peripheral margins thereof project beyond such walls 22, 23. At the side of the chamber 21 bounded by the wall 23, the take-off duct 27 is defined by an additional horizontal wall 57 projecting laterally from the wall 23 and by a downwardly projecting end wall 58 extending therefrom. The take-off duct 27 connects with a passageway 50, formed behind the rear wall 22 of the cabinet and above the air supply duct 26, by provision of additional outer walls 59, 60 respectively. Thus, in this case, the gap 29 is defined between the rim or flange 28 and the walls 58, 59. The air being drawn out of the working chamber 21 thus flows laterally outwardly over the flange or rim 28 and is aspirated from the peripheral margins of the floor over the flange or rim 28. This constitutes to enhancing the Coanda effect of the air traversing the upper surface of the floor 24, assuring as with the preceding embodiments of Figs. 2 and 3, that there is no divergence or only insignificant divergence in the descending air stream.

Fig. 5 illustrates how the invention may be applied to a workstation in the form of an autopsy

table. In this case, a descending air stream is created, e.g. by a hood or other suitable device not shown, above a floor 64 below which is take-off duct 67 having upwardly-projecting sidewalls 68, 69 with inturned wings 70 overhanging the peripheral margins of the floor 64 to define gaps 71, 72 through which air can be drawn away over shallow flanges or lips 73 of the floor 64, with the aid of a fan 65 in the take-off duct 67. As with the preceding examples of the workstation of the invention, the flanges or lips 73 do not exceed 2 cms in height (being for example 1 to 1.5 cms in height) and this ensures adhesion of the air flow across the upper surface of the floor 64 and that the descending air approaches the floor 64 substantially perpendicularly and without diverging or creating dead spaces.

CLAIMS

1. An air-conditioned workstation of the kind comprising a working area and having air circulation means for supplying filtered air to this working area, thereby to lessen the risk of cross-contamination of material being worked upon in the area, or of contamination of or by persons working in the area, and in which air is caused to flow downwards towards a generally horizontal planar work surface characterised in that said work surface is provided around its perimeter with a shallow lip or flange of height not exceeding 2cms and in that means is provided for enabling suction to be applied so as to draw air, laterally over said lip or flange, from above the work surface.

2. An air-conditioned workstation as claimed in claim 1 wherein the lip or flange is between 1 cm and 1.5 cms in height.

3. An air-conditioned workstation as claimed in claim 1 or 2 wherein a gap is provided around the perimeter of the work surface, so that air drawn laterally over the lip or flange flows through said gap to a take-off duct.

4. An air-conditioned workstation as claimed in claim 3 wherein the gap is masked by mesh panels so that the take-off duct cannot be blocked by objects passing through the gap from the working area.

5. An air-conditioned workstation as claimed in claim 3 or 4 wherein the gap is located outwardly of the lip or flange and air drawn laterally over the lip or flange flows downwards through the gap to the take-off duct.

6. An air-conditioned workstation as claimed in claim 3, 4 or 5 wherein the gap is defined on the one hand between the lip or flange of the generally horizontal work surface and, on the other hand, upright walls extending adjacent the lip or flange at a fixed distance therefrom.

7. An air-conditioned workstation as claimed in any of claims 3 to 6 wherein the peripheral margins of the work surface project beyond a number of upright walls which terminate, at their lower edges, at a short spacing above the floor.

8. An air-conditioned workstation substantially as hereinbefore described with reference to and as illustrated by the embodiments shown in Figs. 2 to 5 of the accompanying drawings.

Printed for Her Majesty's Stationery Office by the Courier Press, Leamington Spa, 1983. Published by the Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained.

PUB-NO: GB002106240A

DOCUMENT-IDENTIFIER: GB 2106240 A

Air-conditioned workstation

PUBN-DATE: April 7, 1983

INVENTOR-INFORMATION:

NAME	COUNTRY
HOWORTH, FREDERICK HUGH	GB

ASSIGNEE-INFORMATION:

NAME	COUNTRY
HOWORTH AIR ENG LTD	GB

APPL-NO: GB08219209

APPL-DATE: July 2, 1982

PRIORITY-DATA: GB08219209A (July 2, 1982)

INT-CL (IPC): F24F007/007

EUR-CL (EPC): F24F003/16

US-CL-CURRENT: 454/57 , 454/187

ABSTRACT:

To avoid creation of a central dead space (in which contamination is likely to occur) between diverging downward currents of air in a work area,

for example chamber 21 of a micro-biological safety cabinet 20, floor 24 is provided with a shallow rim or flange 28, of height not exceeding 2 cm. Down-flowing air approaches floor 24 vertically and only moves outwards, in accordance with the Coanda effect, upon encountering floor 24. Suction is applied to take-off duct 27 to enhance lateral movement of air over the lip or flange 28. □